WATER RIGHTS OWNERSHIP IN SULTANATE OF OMAN: A CASE STUDY ON THE *AFLĀJ* INSTITUTION IN NORTHERN OMAN

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UNIVERSITI SAINS MALAYSIA

2024

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by

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Thesis submitted in fulfilment of the requirements for the degree of Doctor of Philosophy

March 2024

ACKNOWLEDGEMENT

Obtaining a doctorate, appeared to me, is a requirement to enhance the knowledge and at the same time to able to participate in research over various scientific spheres. Sometime is nice to obtain it immediately after the master's degree but commitment to many activities in our dairy life has delayed things further. Nevertheless, here I am with the support of family, friends and colleagues made things easy. Also, it is appreciated briefly to state my educational journey; started my bachelor's degree from the best University in the field of Agriculture in UK (Reading University). Then had the opportunity to work and obtain experience from Sultan Qaboos University. Another opportunity obtained of winning a scholarship from this institute to undertake a master's degree in another best university in UK in the field of Agriculture Economics (Wye College, London University, 1997). Now in expressing words of thanks for achieving the doctorate, the above-mentioned educational journey with collaboration obtained from various key-members have equally made this achievement. From the nice working environment of the USM campus with many international students worldwide and easily access academic as well as administrative staffs, greatly contributed to the success of PhD. Particular thanks go my first supervisor Dr. **Suzyrman Bin Sibly** and other academician as well administrative staffs of the Centre of Global Sustainability studies in providing assistance and guidance during the first two semesters of the program before being transferred to the Islamic studies department, School of Humanities. Finally, I am deeply grateful to my newly appointed supervisor **Dr. Jasni Sulong** in sharing with me his great knowledge in writing a typical thesis standard and for his quick respond in any administrative assistance, providing advice to participate in local as well as international conferences and workshop and always advising in trying to be more specific and to summarize things further. Also, thanks to all staff of the School of Humanities and friends in making this thesis completed.

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TRANSLITERATION

The library of congress, Dewan Bahasa dan Pustaka (DB) (www.wikidata.org) and Merriam dictionary (https://www.merriam/dictionary) are used for this thesis. However, since there are many what known as Islamic Arabic words require translation, the English dictionary does not hold these words. It is DB hold these words. For example, looking at the word *aflāj* the dictionary does not have such a word, but the DB offer several translations (a. qanat (*aflāj)* underground canal in hot and dry areas, irrigation system in Oman and tradition irrigation network system). Similarly, with the Islamic Arabic words like *uşūl* in Islam found using DB two different translation 1) *uşūl al-fiqh* and *uşūl al-Din* (it relates to five principle of the twelve Shia theology). Other words which are commonly used in English (e.g.., wadi) are not translated or italicized. Also, place names lift as it is without translation like city names (e.g., *Nizwa*, *Izki* etc.).

TRANSLITERATION EXAMPLE

1. Konsonan

Huruf Arab	Huruf Rumi	Contoh Asal	Contoh Transliterasi
ا	-		
ب	b	بدل	badala
ت	t	تمر	tamr
ث	th	ثورة	thawrah
ج	j	جمال	jamal
ح	ḥ	حديث	hadith
خ	kh	خالد	Khalid
د	d	ديوان	Diwan etc.

2. Vokal Pendek

Huruf Arab	Huruf Rumi	Contoh Asal	Contoh Transliterasi
ـَ	a	فعل	fa'ala
ـِ	i	حسب	hasiba
ـُ	u	كتب	kutiba

3. Vokal Panjang

Huruf Arab	Huruf Rumi	Contoh Asal	Contoh Transliterasi
ا ،ي	a	كاتب ، قضى	katib,qada
ي	i	كريم	karim
و	u	حروف	huruf

4. Diftong

Huruf Arab	Huruf Rumi	Contoh Transliterasi
وْ	قوْل	qawl
يْ	سيْف	sayf

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PEMILIKAN HAK AIR DI KESULTANAN OMAN : KAJIAN KES TERHADAP INSTITUSI *AFLĀJ* DI OMAN UTARA

ABSTRAK

Kajian kes menggunakan sistem aflaj purba (bentuk tunggal: falaj) semasa pemerintahan Kesultanan Oman yang mengkaji perkaitan antara variasi fizikal air dan perkembangan pemilikan dan institusi hak dalam air Islam. Terdapat tiga jenis sistem aflaj di Oman iaitu daudi (kata Arab yang berasal dari terowong dalam), ghaili (berasal dari bekalan air permukaan oasis), dan ayni (mata air semula jadi). Maka, kajian kes pensampelan memilih (selective sampling), dari sistem falaj penempatan perkampungan terbesar di Oman digunakan iaitu tujuh daripadanya jenis daudi yang terbesar, empat daripada jenis ghaili yang terbesar, dan dua daripada jenis ayni yang diketahui ramai. Jurang pengetahuan kita tentang cara mentakrifkan pemilikan dan institusi hak air Islam, dari segi definisi dan struktur peraturan yang tepat dan berkaitan dengan hak dibincangkan. Untuk menyediakan rangka kerja persampelan yang mewakili dan memberikan gambaran lengkap definisi tersebut, tesis ini menggunakan tiga kaedah: temu bual mendalam, susunan adat Islam (urf) dan model Oakerson (1986). Hasil kajian mengesahkan bahawa wujud variasi utama dari segi variasi air fizikal antara tiga jenis falaj. Ini menghasilkan dua sistem putaran: raddat dan shir’b dan mengenal pasti hak air milik persendirian dengan unit pengukur transaksi tak tersirat yang hanya dilampirkan dengan sistem raddat. Pertama, mereka membahagikan sumber air fizikal di Oman kepada dua kategori utama yang mempunyai institusinya sendiri: syir'b tersirat dan raddat tak tersirat. Walaupun jenis duadi dicirikan oleh aliran air yang tetap dan kadar pelepasan yang tinggi, institusi yang diharapkan dapat menjamin hak air yang jelas. Sebaliknya, kerana jenis ghaili

yang dicirikan dengan bekalan aliran air semula jadi biasanya diperoleh daripada air permukaan oasis menyebabkan pengaturan hak air institusi tersirat. Penemuan ini banyak membantu dalam mentakrifkan konsep pemilikan air di Oman menggunakan dua konsep utama: 1) keselamatan aliran yang menyediakan pengaturan institusi sosial yang boleh diterima. 2) menerapkan konsep tersurat dan tersirat daripada kesusasteraan dan susunan air adat (urf) daripada hukum air Islam. Kedua, penggunaan kerangka analitikal yang berbeza antara pengaturan adat Islam dan model berbeza Oakerson sangat membantu dalam memahami tiga elemen utama iaitu: 1) peraturan operasi yang digunakan oleh sistem shir'b dan raddat, 2) syarat yang diperlukan untuk pemilikan air dalam hal sempadan fizikal dan undang-undang, 3) corak interaksi. Akhirnya, boleh disimpulkan bahawa sistem aflaj bukan hanya merupakan teknik pemindahan air semula jadi buatan manusia ke penempatan, tetapi ia juga menyimpan pengetahuan unik tentang pengaturan institusi berdasarkan prinsip-prinsip Islam.

WATER RIGHTS OWNERSHIP IN SULTANATE OF OMAN: A CASE STUDY ON THE *AFLĀJ* INSTITUTION IN NORTHERN OMAN

ABSTRACT

Using the ancient *aflāj (*singular *falāj)* system in Sultanate of Oman as a case study, this thesis investigates the Islamic water rights ownership and institution. This was conducted by analyzing the relationship of the physical water extraction variation among the three *aflāj* types in Oman and the development of water right types and the Islamic equitable principles/institutions. In literature many principles concerning water management and administration have been discussed. The most used one, in most Islamic studies, is how to manage water (as a natural gift) in relation with what Allah almighty given natural resource (also known as ecosystem) and human interaction. However, the focus of this thesis to fulfil the gap in our knowledge in how to provide a legal recognition of water rights ownership and institution. In fact, a guiding tool using Oakerson operational rule/institution which is considered as soft constrain for two main reasons: 1) decision making made operative only through human knowledge, choice, and action 2) rules found in decision making exist entirely in ream language (whether written or unwritten). It is these written and unwritten rules that have been applied in describing *aflāj* historical institutional (which researcher called Islamic equitable principles) and confirms with revealed information found within *aflāj* communities in Oman. In addition, Islamic equitable principles have been used to avoid confusion with another Islamic term known as *uşūl al-fiĝh* or jurisprudences. There are three types of these *aflāj* system in Oman: *daūdī* (an Arabic word derived from deep tunnel), *ghấilī* (derived from oasis surface water supply) and

aỹnī (natural spring). Hence, selective sampling case study, from the most and largest village-settlement falāj system in Oman, has been used: seven of the largest *daūdī type*, four of the largest *ghấilī* type and two of the most *known aỹnī* type. Results confirm the fact that exist major variations in terms of physical water variation among the three *falāj* types forming two main water rights categories (each hold its own institution): implicit *shir'b* and explicit *raddat.* This finding has explored the natural water sources in Oman into two main types in terms ownership security: a *dấudi* and *aỹnī* types by which characterized with a constant water flow and high discharge rate and a *ghấilī* types characterized with unsecured water flow supply; normally obtained from oasis surface. Hence, the former attached with a privately owned water rights with explicit transacting measuring units. Finaly, based on such variation and the water law supply fluctuating pattern, two significantly legal framework, concerning water rights ownership and administration, by which this thesis result offers the worldwide countries to use: 1) condition required for water ownership in terms of physical and legal boundaries 2) a legal recognized framework based on what known as Islamic customary water arrangement (*ĩrrf*).

CHAPTER 1

INTRODUCTION

1.1 Preface

While a relationship between frequency of rainfall/precipitation and water storage in aquifer exists, such link found in certain verses of Holy Qur'ān (the holy book of Muslims). For example, in Al-Ra'd verse 17 mentioned:

أَنزَلَ مِنَ ٱلسَّمَآءِ مَآءً فَسَالَتْ أَوْدِيَةٌۢ بِقَدَرِهَا فَٱحْتَمَلَ ٱلسَّيْلُ زَبَدًا رَّابِيًا ۚ

Meaning: "… Allah Almighty sends down rain from the sky, causing the valleys to flow, each according to its capacity". Similarly, mentioned in Al-Zum*ā*r verse 21:

أَلَمْ تَرَ أَنَّ ٱللَّهَ أَنزَلَ مِنَ ٱلسَّمَآءِ مَآءً فَسَلَكَهُۥ يَنَـٰبِيعَ فِى ٱلْأَرْضِ ثُمَّ يُخْرِجُ بِهِۦ زَرْعًا مُّخْتَلِفًا أَلْوَٰنُهُۥ ثُمَّ يَهِيجُ فَتَرَىٰهُ مُصْفَرًّا ثُمَّ يَجْعَلُهُۥ حُطَـٰمًا ۚ

Meaning: "…do you not see that Allah sends down rain from the sky—channeling it through streams in the earth—then produces with it crops of various colors, then they dry up and you see them wither, and then He reduces them to chaff" (https://www.altafsir.com/index.asp).It is not coincidence that worldwide this planet's water sources come either from surface water, rivers and lakes, or groundwater. However, in Oman closer link is found regarding the above-mentioned verses interpretation.

First, there exist what are known as *ghāyl*/valleys (sometimes referred as wadis/oasis). This is precisely as mentioned with the first verse (sends down rain from the sky, causing the valleys to flow). Now in Oman, as an arid regional type, hold rainfall pattern which normally described as heavily flooded/flush (intense and albert) causing valley (oasis) to flow (Stanger, 1985).

In contrast, the situation with the second verse is completely different. The difference lies in what happens with the rain sent down from the sky (it clearly mentioned: —channeling it through streams in the earth). This is again precisely what happen in Oman as water extracted from the upper part of the aquifer in the mountains, and it is achieved using a long underground tunnel. Hence, the locals use the term *daūdī* to refer to this traditional construction-engineer of a long tunnel (Wilkinson 1978).

The second related issue is the fact that with these water sources there exist two historical early human civilizations: one arose along great valleys depending upon surface water and the other developed in places where groundwater extraction was possible. Hence, over history, people from different cultures have continuously struggled and invested within these two main sources to obtain two folded aims: 1) to develop irrigated-cultivated areas along oases or at groundwater sites of early human settlement 2) to build up what is known as hydraulic civilization along great valleys using surface water. Probably is surface briefly to mention here two fundamental facts: first the initial work by Steward (1949) discussed hydraulic civilization and urban development for the five ancient civilizations: Peru, Mesoamerica, Mesopotamia, Egypt, and China (in fact he referred to these as the five principal centers of the world).

On the other hand, Adams (1962), Al-Jahwari (2009) and Wilkinson (1977) investigated the early human settlement and found that early human clusters or communities developed along riverbanks, oases or at coastal sites. The second fact is that since these two systems developed in different locations, we may say that groundwater was developed in regions where there was no easy access to surface water. Although a vast body of literature discusses how this civilization had been developed, it is beyond the scope of this thesis to discuss these hydraulic civilizations

in more detail. However, the purpose here is to use Oman as a case study and a typical representative of the above-mentioned groundwater small communities,

Many researchers investigated the earliest water exploration systems on the Arabian Peninsula and in Oman in particular. First, availability of water has been a crucial element in the settlement of Oman. This stems from the fact that in a country positioned in an arid region, water rathar than land is a scarce and valuable resource (Costa, 1983). Second, people in this region placed particular emphasis on the art of water exploitation using different techniques. The most ancient widely developed techniques are locally known as falāj , plural *aflāj*.

Note similar systems are found in many countries but known by different terms such as *qanat* inside Iran; *karez* in countries in south-west Asia outside Iran and in Afghanistan; *belichan* in Kurdistan; *foggara* in North Africa; and *falāj* , *aflāj* or *felledj* in Arabia (Cressey, 1958). In many of these countries there has been a dramatic decline in their numbers, and in some they have almost disappeared (Lightfoot, 2000).

1.2 Research Background

While it is clearly mentioned in the Holy Qur'ān[1] that Allah almighty created from water every living thing, availability of water is required in almost all aspect of day-to-day activities. Although Chuieco (2012, pp.11-12) cited two important verses from the Qur'ān concerning human relationship and the environment, provided misinterpretation of these verses. The first verse "O men, adore your Lord who has created you and those who were before you, and fear God, who has made the earth a carpet for you and of the sky a castle, and has made water come down from the sky

[1] "Do the disbelievers not see that the heavens and the earth were one mass, and We tore them apart? And We made from water every living thing. Will they not believe?" (*al-anbya* verse 30)

with which to extract from the earth those fruits that are your daily food' (*Al-Baqarah* verses 21–22). The second verse "It is He Who has made the earth subservient to you, to walk through its tracts and eat of His provided sustenance" (Al-Mulk verse 14).

The main reason for Chuieco misinterpretation attributed to his link between what he called how we conceive the role of nature in God's creation, which (as he thinks) have a second-order importance. Hence, he directly interpreted that Islam hold the same what he called Judeo-Christian tradition in consideration on the pre-eminence of human over other creatures. However, the relationship between mankind on one side and other creatures within their ecosystem is very clear within Islamic theory.

First, even though Allah almighty created all creatures (in our plant to be utilized by mankind, they are responsible in the day of judgment in the sense that how they approached them; in other words, must consume in the level to fulfil their need and to develop their day-to-day life activities. Once an excess from such a required level exceeded what has been commanded, it is not accepted.

In fact, Loodin and Wolf (2021) listed two main responsibilities: 1) mankind is to preserve and protect nature 2) are users of nature (provided example of using freshwater for irrigation and domestic purposes. Water, as considered among the most significant of those creatures on our earth, not only requires knowledge on how to utilize it, but most importantly how to develop policies and regulation over its managerial framework.

Anwar and Tasgheer (2021) argued that since in the modern world water conservation becoming a threating issue, world need a comprehensive water management system. Such as system, as they viewed it, can help humanity to cope with the water scarcity challenges; stated "… Islam, as a revealed religion, gives

humanity the principles of an extensive water management system" (Anwar and Tasgheer,2021, p.2).

Based on this introductory background, the main purpose of this thesis is to contribute over such Islamic managerial system for water as a commodity. In particular, to investigate Islamic water rights ownership and institution. This is conducted by analyzing the relationship of the physical water extraction variation among the three *aflāj* types in Oman and the development of water right types and institutions.

To do this, require first to narrow the wide western literature regarding water analyzing problem from a wide water problem analysis themes such as water institution (Saleth and Dinar, 2005)), property rights (Alchian & Demsetz, 1973; Rosegrant et al., 1995; Rosegrant & Binswanger, 1994) (sometime known as well-defined rights (Easter et al., 1999; Randall, 1983; Senzanje & van der Zaag, 2004)) and water market approach and efficiency (Zekri et al., 2006) (sometime referred as tradable water rights (Rosegrant et al., 1995; Oakerson, 1992), two main themes: 1) equitably using Islamic water rights classification and legal ownership definition (Kamali; 1991, 1993) and 2) Islamic equitable principles /institutional operational rules (Dietz, 2003; Saleth & Dinar, 2004; Saleth & Dinar, 2005).

Second to include three main variables: 1) physical water extraction variation of the naturally flowing watercourse 2) ancient *aflāj* system operated in northern of Oman 3) Islamic law/*shariah* and the customary arrangement (*ũrf*).

The first variable is known as physical constraint of the common-pool resources and how a managerial framework reflected upon such physical variation of the resource (water). Note from the early-stage Randall (1981), Milliman (1965) and

young (1986) clearly conclude that the physical nature of the resources is to be blamed for the difficulty of asserting private ownership. Demsetz (2002) argued that private propety rights could be made more complete by adding the degree of risk. He attributed this that to establish a private water right first the varaible of risk should be not present during resource allocation mechansim with a strong legal institution (Demsetz, 2002).

The second variable is to use the *aflāj* in Oman to represent a unique example of long historical settlement since millenniums (Remmington, 2018; Zekri et al., 2014) and as settlers continuously invented certain techniques along with knowledge to adopt with the hashed arid environment (Sutton, 1984; Wheeler et al., 2016). The third variable is the show and investigate how the *aflāj* system hold its own Islamic principles and how the Islamic customary/*ʿurf* applied over the legal water rights recognition in courts.

Note the fact that the issue of the ancient systems and associated inherited management knowledge is viewed as an important indigenous knowledge within the area of water management and administration (Watson-Verran & Turnbull, 1995; Mauro & Preston, 2000), not only concerning the physcial water distrabution, but most impprtantly how to contribute over the legal water rights onwrship and trasaction. For example, Trawick (2001) wrote "…. a fresh look at organization through case studies which look at the history and broad cultural environment of, and non-vertical relationships in new types of organizations which do not conform to the bureaucratic model" (Trawick,2001, p.2).

Hence, one might ask these two questions: what can be learned from these ancient, operated irrigation systems? What can be learned regarding the water distribution with respect to the water right classification? These two questions shall

be the focus of this thesis using ancient man-made irrigation system in Sultanate of Oman. In addition, the issue of water rights ownership and their associated institutional arrangements, is not yet fully evaluated using empirical data.

Much of this traditional knowledge has values which, in my view, are different from those found in western literature, where very little studies and documentation are carried out. To fill this gap between the western theoretical water rights ownership and Islamic law implemented water rights, authors conducted this study in the northern part of Sultanate of Oman. As we will discuss later in detail, various type of falāj water rights is exist some are belonged to certain historical known users such as the endowment water rights (locally known as *wāqf*), some belong to the state (the treasury) (in the past this known as *bat-al-mal*), and some rights belong the system itself. The fieldwork was conducted over a period of two years; 2017 to 2019 in several governing region at the Northern part of Oman. It is important to note that the finding on this thesis is the overall revealed result of the comprehensive study indicated earlier, but certain finding has been already published elsewhere (see Al Marshoudi, 2017; Al-Marshoudi, 2018; Al-Marshoudi et al., 2021) but researcher will not tough upon here.

1.2.1 Location background

It is often mentioned the fact that Sultanate of Oman occupies the South-East corner of the Arabian Peninsula with latitudes of 16’ 40; 26’ 20’ north and longitudes of 51’ 50’; 59’ 40’ east. This unique position has provided two main human settlement areas: the coastal living areas and the mountain and hill settlement areas. For example, it has a coastal line extending almost 3165 km, as from the Strait of Hormuz in the North to the borders of the Republic of Yemen and overlooking at three seas; the Arabian Gulf, Gulf of Oman, and the Arabian Sea (see Figure 1.1).

The second living areas comprised of mountains, desert, and settlement agriculture. Now, since the overall area of 300,000 km^2 comprised of mountains, desert and settlement agriculture, there is a total of 125,756 ha which can be used for agricultural settlement (an equivalent of 1258 km^2, 0.04 % of the country total area). In addition, one may include several hundred areas that endowed with mountainous regions and oases, as these considered to supply water to the cultivated areas.

Figure 1.1 Location of Oman

Source: https://www.worldatlas.com/maps/oman

1.2.2 Climate background

Oman classified among arid subtropical climate with large differences among regions. In most northern cities of the country, in general, experience extremely hot summer temperatures. However, there exist two different regions: southern region that receiving Indian cool monsoon during summer and the subtropical hill climate (Ahmed & Choudri, 2012). For example, looking at three different located cities; *Saiq* (located in the highest mountain on the Arab Peninsula, latitude of 23.0723° N 57.6609° E represents the hill climate, *Buraimi* in the extreme north desert latitude of 24.2815°N 55.8246° E and *Salalah* in the southern region latitude of 17.0194° N 54.1108° E which normally receiving Indian cool monsoon during summer. Average maximum temperatures for these cities were recorded in 2017 as follows 33, 46, and 31 respectively for the summer months, June, July, and August. Similarly, average rainfall was recorded in the same year and same months as follows: 15, 0.33, and 24 mm respectively (MON,2020).

1.2.3 Geological structure background

Another factor closely related to Oman location and climatic is the geological structure. In Oman, the climate and geology form with the overall environmental context to obtain what is known as Oman hydrogeology. This considered as a unique in many respects and most of which is the type of rocks and their ability to store and infiltrate water. For instance, Stanger (1985) listed several natural and geographical characteristics by which hard-rock aquifer and water recharge balance formed. He listed things like 1) rainfall in Oman tend to be intense but of short duration 2) soil retention and interception by vegetation are both minimum 3) surface runoff typically occurs beyond a precipitation threshold and within a few minutes of the onset of rain

4) barren hill slopes are covered in innumerable rivulets which rapidly converge into streams and flash foods upon which most aquifer recharged.

Dewandel et al. (2005) argued that there is a natural perennial which contains an ophiolite rock to store groundwater over long periods. He defined ophiolite in Oman as a piece of an oceanic lithosphere that was thrust onto that Arabian Plate 85 million years ago (Al-Shukaili,2011).

1.2.4 History background

Difference views concerning Oman history have been acknowledged by several researchers. For example, Speece (1989) described history of Oman as a story of competition. He attributed such description to the fact that it is a community of tribal conflicts, scarcity of nature resources, particularly water and continuous growing of demographic structure. Others provided evidence by which organized powerful central government was essentially required to maintain orders and enforce rules and regulation. This has been formulated through the process of colonization and migration.

Wilkinson (1977) demonstrated that settlement pattern and social structures date back at least to the second Persian Invasion with stable central government 1,500 years ago. Phillips (1971) argued that Malik bin Fahm (Qantabi tribe of *Azd)* residing at Marib in the Yemen at the end of the first century A.D. immigrated into Oman, and he was the first historical independent master of all the land (of Oman) ruling justly for seventy years. Then the era of Islam came to Oman in the 7^{th} and 8^{th} centuries associated with the period of Imamate (Al-Rawas, 1990; Wilkinson, 1990).

In the past, few actual data concerning history settlement in Oman, by which a detailed analysis of the pre-oil economic structure, have been compiled since the turn of the 20th century. However, several studies, which applied their own views concerning such past society, are available. For instance, Wilkinson (1990) showed that historically fishing and agriculture form the basis of the traditional economy for the settlements of the coastal strip. Whereas interior of Oman the economy and settlement pattern, in this region, is determined by water supply and the way this has been exploited.

Speece (1989) viewed coastal of the country was always very trade-oriented and open to foreign influences, while the interior was oriented toward self-sufficiency and the tribe and agricultural villages were made up of several tribes and formed the basis mode of organization. Costa (1983) looked at the discovery of oil during 1950's, followed by rapid development of the alien technology, as form a dramatic threat to the conservation of a remained untouched resources. Out of these views, one can formulate a general view of traditional-based society as follows; it was dependent entirely on natural resources, cooperation to conserve these resources was highly motivated, day-to-day life activities were very difficult.

1.2.5 Omani legal and legislation structure

In 1970, when the present government took over from the previous states, Oman has developed a modern ministerial as well as legal official bodies to carry-out its day-to-activities. It is important to indicate the fact that the government placed particular emphasis on preserving the heritage and culture of the existing settlements within the

process of modernization.[2] Then in 1996, the government announces what is called "The Basic Law of the State" which offer a main guiding legal framework for the development and implementation of all legislation and government policy[3]. To do this, it establishes the *majlīs* of Oman, comprising of elected *majlīs al-shura* and the appointed *majlīs a-dāwla*, as well as an independent judiciary[4].

In fact, these were incorporated from the previous statue political structure. For example. Ghubash (2006) listed three main councils/ *majlīs* and how they were operated in the past:': i) the council of Muslim scholars (senate); ii) the General council; and iii) the permanent assembly, which holds the legislative power for the state and is led by a group of scholars known *as āhl-hāl* and *agd* (literally those who can make and break). He argued that these councils do not operate within a written constitution or published laws, but that they rathar exist and operate in conformity with constitutional rules and traditional customs that are clear and cannot be set aside.

However, the present government legal sources of knowledge obtained from two main parts: inherited unwritten legal legislation and the modern written legal sources. The inherited unwritten sources are normally left to be decided and managed by appointed judges, while the modern written legal sources are controlled by the three established modern councils (as described above).

Finally, certain legal issues were left for the jurist to decide and judge using shariah main sources. In fact, Hill (1983) pointed out the fact that Oman has three what he called basic parallel interrelated sources of law: i) Islamic law (he indicated this law

[2] For example, Gugolz (1996) argued that the Sultan and his government established a well-planned policy to develop the country while intending, at the same time, to avoid a rapid modernization.
[3] Source: Ministry of Foreign Affairs https://omanportal.gov.om/wps/portal/index/gov/omangov/BasicLawofState
[4] Examples of several written law's legislation concerning labor, social security, land, insurance, and banking as well as numerous regulations and procedures in the form of ministerial decisions

is derived from Qur'ān, *Sunna, Ijma* and *Qiyās* ii) Royal degrees and Ministerial Decisions (he called this as statutory system of law expressed in Royal degrees) iii) Private international law (he indicated as applied to commercial and financial transaction) (Hill, 1986, p.507). To further elaborate upon the above-mentioned Oman law sources (written and unwritten legislative legal law), require rising the water main source and how apply its legal regulatory system (as this will facilitate this thesis main objectives which explained below).

1.2.6 legal and legislation of water resources in Oman

In general, groundwater aquifer considered as the primary source of water for irrigation in Oman for the two main farming systems: the first one is known the *aflaj*-shared communities and the second referred as the large commercial farms. The major differences between the two is the fact that the community-shared *aflāj* followed what is known as Islamic/*ŭrf* customary arrangement while the large-commercial farming system uses what called privately-owned well pumps which governed and regulated by royal degrees and Ministerial decisions (Al-Marshudi, 1997; Zakri and Al-Marshudi, 2008).

However, sometimes regulation is required to protect the existing *aflāj* systems. For example, as Zekri and Al-Marhudi (2008) pointed out that in 1983, the Water Resource Council decided that no wells should be constructed within 3.5 km of the mother well of a *falāj*. This decision was prompted by complaints about newly dug and drilled wells affecting *aflāj* aquifer.

Globally, there are several what known as common water right laws which are practiced by many countries: prior appropriation, riparian water, and permit water law system (Randall, 1981). Many western studies attempted to incorporate these laws

with a newly developed water market policy. For example, in Australia, where surface water is becoming a scarce resource, water markets using water entitlements and allocations have been proposed within the permit water law system since the mid-1980s (Wheeler, 2016).

However, due to the present of large physical variation nature over a watercourse resources (in terms of mobility and large size) place difficulty on the success of these measures, especially in asserting a measuring unit (as this will be discussed in more detail below). Hence, many researchers and water proficiencies studied many of the ancient community-managed irrigation systems across countries[5].

It is important to point out these are very much concerned with the indigenous knowledge about water distribution but not in the matter of the legal water right ownership. It is the ancient system *aflāj* (singular *falāj*) in Oman provided wider contribution over the matter since millennium.

1.3 Research problem

As earlier mentioned, that this thesis investigates Islamic water rights ownership and institution. The analyzing of the problem derived from the fact that natural common watercourse being not able to attach a privately owned water right. Hence, many studies examined what are known as water-related institutions, which are derived from the physical characteristics of the natural watercourse, from two main perspectives: first, it was discussed using mobility of water and size of the resource.

[5] Like the Nepal farmer-managed irrigation system (Ostrom and Gardner 1993), canal irrigation system in India (Meinzen-Dick, Raju et al. 2002) and indigenous water distribution system in Andean village, Peru (Trawick 2001).

For instance, Young (1986) and Randall (1983) have demonstrated that water mobility and the economics of the large-scale of surface water that requires large scale storage. Milliman specifically mentioned the fact that is difficult to establish a clear property right to water because water is a fleeting resource which exists partly as a store and partly as a flow. Second, water being so large and hence it is difficult to use a measurable unit when trade is conducted. Here Dales (1968) suggested solving this problem on the extent how to insert what he called divisibility asset-unit. However, such proposal faced with difficulty, as Dales further explained; that is any natural resource cannot apply divisibility; stated "…as is well known, however, certain characteristics of a natural water system create special problems in ownership. The characteristics of an ownership system reflect in part the "divisibility" of the asset to which it is applied" (Dales,1968, p.797). He attributed this to the fact that in water the asset-unit is very large, especially in great and large rivers and lakes.

He then contrasted this problem with land, which the asset-unit is very small – just a few square yards, by this the asset can be held by many individual owners, while in water the asset-unit is very large cannot be divided into smaller units. Note that the physical nature of the resources (mobility and large size) is considered as the major contributing factor to the market failure (Randall, 1983; Milliman, 1959; Young, 1986).

Another related water problem is concerned with the definition of public rights. For example, Western researchers tend to use the notion of common property to refer to communal rights. For instance, Alchian and Demsetz (1973) used a term known as communal rights to describe a bundle of rights which includes the right to use a scarce resource but fails to include the right of an "absentee owner" to exclude others from using the resource (as they put it). Here they provided an example of the use of a city

sidewalk, or a "public" road is communal, and the rights to till or hunt the land have been subjected to this form of ownership frequently. Then they showed how the public uses such rights; neither the state nor individual citizens can exclude others from using the resource except by prior and continuing use of the resource. The first driver to enter the public road has a right of use that continues for as long as he uses the road" (Alchian and Demsetz, 1973, p.19).

However, although Kamali's (1993) (who studied Islami law/shariah) placed rights classification (in general) into two main categories (right for the individual and the right for the creator, using the corporate personality as public rights not clear. This is attributed the fact that Kamali in explaining his theoretical example (charitable foundation (*wāqf*), and the national treasury (*bāy-al-māl*), placed two main conditions: 1) the capacity to incur financial liability and rights and 2) has a collective or common interest that is separate from and unable to merge into a private or individual interest. Then he went on to say "…the latter (*bāyt-al-māl*) meets both above conditions, for it manifests the common interests of the community and, in this connection, incurs such rights as receiving the estate of a person who died without leaving a legal heir, becoming a party to disputes, and incurring financial liability (i.e., the remuneration of tax collectors) (Kamali, 1993, p.454).

Nevertheless, although certain researchers (who classified water rights in Oman into private and public), did not attached them within Islamic water rights definition. For example, despite the fact that the two most important public right within previous political states in Oman were endowments (locally known as *wāqf)* and public finance (locally referred as *bāyt-al-māl)*, rarely seldom mentioned within Wilkinson's studies (Wilkinson, 1974; Wilkinson, 1977). Similarly, in spite the fact that Zekri and Al-Marshudi (2008) discussed the *wāqf* water rights in Oman (they called them as

quasi-public water rights; see below), they did not mention the *bāyt-al-māl* public right. They probably not introduced to such right. In more recent study by Megdiche Kharrat et al. (2016) niether mentioned *wāqf* or quasi-public water rights when deffernciated public from private rights; stated " … a public ownership, which consists of using the water for domestic purpose such as drinking, washing clothes, and also for livestock drinking, and a private ownership, which concerns the water used for irrigation" (Megdiche-Kharrat et al., 2016, p.72).

Finally, when reviewing the western literature found a different view in defining right opposed to ownership. For example, when interpreting the withdrawal and access attributable rights introduced by Schlager and Ostrom (1992) (they called them as attributed rights) were attached as 1) withdrawal rights which has been introduced to give the holder the right to extract part of the flow of resource units (e.g., catch fish, appropriate water etc.) and 2) the access right, is the right to enter a resource. However, the problem here was confused as many researched thinks as possible these are attached with an ownership right to a common resource. As a matter of fact, that despite that Schlager and Ostrom proposed withdrawal right for the fishery industry, they did not mean to establish private ownership here, stated "by alienation we specifically mean the authority to sell or lease collective-choice rights" they went on to state, "we do not mean include the ability to bequeath" (Schlager and Ostrom,1992, p. 251).

Alchian and Demstz (1973) defined what is owned are rights to use resources including one's body and mind (as they put it), placed certain prohibition actions. They stated "…what are owned are socially recognized rights of action" (Alchian and Demstz,1997, p.17). While Dales (1968) used what he called convenient abbreviation for a complex interaction between a legal concept and an economic concept; stated

"…ownership consists of a bundle of legally- defined user rights to an asset." He then cited Coase statement that it is rights, never objects, that are owned, and the rights themselves are always limited by law; "outright" ownership can never, by definition, extend to the use of an asset for illegal purposes.

1.4 Research questions

By choosing the most popular concepts within western literature in analyzing water problem (institutional arrangements; structure of the rules) as a vehicle to understand how the Islamic water rights are defined, classified, and operated, this thesis focuses on the following research questions:

1. What conditions are required for water ownership?
2. How Islamic law/*shariah* handle water rights operation?
3. How Islamic law/*shariah* classify water rights?

As previously mentioned, *aflāj* system in Oman is used as variable to investigate the physical water extraction variation among three *aflāj* types and to what extent development of Islamic water rights ownership institution function. This requires finding out what operational rules or Islamic equitable principles normally used. Here in attempt is made to understand the regional knowledge about the climate and the hydro-geological conditions of the surrounding environment and asking whether a crucial determinant of the evolution of the *aflāj* water rights and their associated institutional arrangements were.

In Oman, where water availability is a crucial element of the social organization within *aflāj* communities, the origin and early development of not only the engineering techniques but also the socio-cultural factors associated with its

management and the sharing of the benefits derived from the water, offer great opportunities for research.

From this, several sub-questions followed:

1. Are there variations in the falāj institutional arrangements among the three falāj types; *daūdī, ghấilī* and *aỹnī*?
2. Does the nature of water flow from these types differ?
3. Do such differences account for the construction differences and the variation in institutional arrangements?
4. To what extent private ownership right exist within falāj institutional arrangements?

Researchers argued that since falāj systems were established in more permanent agricultural settlements, settlers were motivated to establish institutions to manage its water distribution and minimize disputes. In addition, to minimize dispute even distribution/equality of water rights size are expected.

Finally, since the issue of asserting/attaching a private ownership water rights over a natural watercourse considered as the most challenging matter, the above indicated research questions concerning the physical water extraction variation will be used to examine the legal ownership status within the country legal courts. Here a variable concerned with water fluctuation of the resource supply by which reflect its physical nature (size) and mobility will be used.

1.5 Research objective

The objectives of this thesis are of two folded: first to investigate Islamic water rights ownership using the physical water extraction variation. Second is to analyze how

what known in Islamic law as equitable principles can be developed to manage different types of Islamic water rights.

First, using the relationship of the physical water extraction variation among the three *aflāj* types and development of equitable principles will provide the two main components: i) physical water extraction variation and to what extent can influence directly or indirectly development of different water rights; ii) concerned with how water ownership can be defined in the light of Islamic law/*sharia*.

Second, it is apparent from the above-mentioned relationship, the need to use a comparative analysis procedure. Here researcher will contrast the ancient Islamic equitable principles in managing different water rights with the modern western institution (sometime referred as operational rules). Third, since the collected data obtained from villages/*wallaỹat* who majorities of its residents are Muslim and governed by Islamic law/*shariah*, integrated school of thought between this Islamic law sources and the western institutional theory will be used. Finally, it is believed that the Islamic equitable principles have existed for more than one thousand years and have proven resilient to adverse climatic and social conditions (Sutton, 1984; Wheeler et al., 2016). In addition, it provided a continuous adaptation to the harsh of the arid region and owns property from which the income necessary for its continued survival can be collected (Zekri et al., 2014).

The objective of this thesis is therefore to:

1. To investigate the Islamic water rights ownership.
2. Analyse the relationship between the physical water extraction variation and development of operational rules/principles (comparative analysis)

From such relationship, three sub-objectives prevail:

- Examine the existed water right types.
- Defined water ownership in the light of western view and Islamic law/sharia.
- Discuss any possible social interaction/cooperation.

3. Provide recommendations for better *aflāj* water management to cope with future development.

1.6 Significant of the study

As indicated in section 1.2 that water regulatory policies can be summarized under two main themes 1) institution/rules structural setting 2) water market approach and efficiency. More specifically most of the western water researchers used these two themes as output criteria: 1) equitably using water property rights (institutional setting) (Dietz, 2003; Saleth & Dinar, 2004; Saleth & Dinar, 2005) and 2) efficiency using water market approach (Easter et al, 1999, Bitran et al., 2014).

However, in this thesis researcher is not trying to measure efficiency or introducing/proposing a water market. It is rather to investigate the relationship between the physical water extraction variation and development of institutions to define Islamic water rights ownership or applying known as Islamic customary *ũrf*.

Hence, regarding with first and second listed water problems the water allocation system in Oman is regarded of being significance to establish/ maintain a fair distribution of water. This is attributed to the fact that Omani water share distribution mechanism obviously reflects a social organizational requirement in the sense that disputes among shareholders are minimized especially for such a very scarce

and communal resource like water. Wilkinson (1983: p.181) indicated that such a social structure is preoccupied with fair distribution among its water shareholders.

First, the time of the flow is the basic component of the whole distributive process (Wilkinson, 1977). Historically, a particular falāj was designed so that all water right holders would receive water at set intervals, every seventh day or so. Second, this normally operated by dividing the whole distributed day (24-hour period) into two equal parts: they say night *bāddah* and a day *bāddah* (Megdiche-Kharrat et al., 2016). This literally means a portion of 12 hours of flow for night and 12 hours of flow daytime (Wilkinson, 1977).

The second innovative aspect is related to how the above indicated whole day (24 hours of flow) was distributed among all existing shareholders. Here the local innovated smaller units to sub-divided each day circulation. As an example of this the hours within the falāj institutional context are measured by a unit known as *athar,* which in general terms is equivalent to 30 minutes (Zekri et al., 2014).

The third listed water problem concerning private ownership will be incubated with Islamic customary arrangement in defining water ownership and how such link offer a significant contribution toward how to recognize water right legal status at courts for two main reasons. The first reason is attributed to the fact that we are dealing with fluctuating renewable natural resources; increased through rainfall and decrease by withdrawal. The second reason is what is known as mobility and large size of the watercourse by which create difficulty in using measuring units.

Another related issue is that *aflāj* institutional arrangements are believed based upon static Islamic rules. These principles cannot be changed or suggest introducing changes. Although recently settlement in Oman have been influenced by the rate of

change and development, *aflāj* institutional arrangements remained under customary village law. Hence the question like: could tribalism, small holdings, and complicated system of the falāj farming, then be open to development? can by any means such changes be handled by this thesis. The answer is no because it is recognized that any suggested changes may bring problems of greater complexity. In addition, we are fully aware that technological change, regional population growth, and market links, each represent significant challenges that must be overcome for successful sustainability to be achieved.

In summary, several writers have acknowledged *aflāj* water institutional arrangements. For example, in the past Sutton (1984) indicated that *falāj* systems owe their continued existence to the well-established social and financial structure. Recently wheeler et al. (2016) described the system as a unique groundwater market has developed in Oman within the falāj irrigation systems. She went on to say "…most of the water is controlled by the village community and semi-public organization (mosques) (Wheeler et al.,2016, p.231). However, few studies have attempted to analyze these institutions within an analytical and modelling framework. Thus, this thesis analyses these institutions by considering two main associated elements.

First, the physical variation which exists regarding water extraction processes (as will be discussed in more detail in Chapter Three). Second, the relationship exists between such physical variation and the development of institutional arrangements and their associated water rights.

1.7 Outline of the analytical framework

As mentioned above, this thesis follows a comparative analysis procedure to achieve its main objectives. First, comparative analysis to contrast between Islamic customary

law/arrangements and the theoretical background of the western as well as Islamic/shariah law. Hence a qualitative content-oriented positivist and subjective methods to collect Omani traditional historical sources will be conducted. Second, to compare the physical water extraction variation among the three *aflāj* types and development of Islamic equitable principles. This is hoped to answer the research question concerning possible classification of Islamic water rights.

Using the ancient *aflāj* system in northern Oman, as a case study, this thesis examines how variation in water extraction among the three *aflāj* type (*daūdī, ghấilī* and *aỹnī*) assist in providing a guidance in defining Islamic legal water ownership and water rights classification. In addition, to what extent operational rules (institution) can be structured. Hence, to evaluate such relationship, this thesis applies 1) field survey in collected data through semi-structured interview to evaluate the hypothesis that existed variation among the three *aflāj* types in terms of physical water extraction process, and 2) Oakerson (1986) common-pool institution management framework as a comparative as well as a guiding tools. Based on these two main elements, the investigation will be divided into two main parts:

1. Water rights ownership analysis

The notion of water ownership definition is examined and analyzed, as mentioned above. This has been widely explored within western academic literature (Dales, 1968; Oakerson, 1986). However, an attempt is made to incorporate Islamic law/shariah in defining and classifying water rights using Oakerson (1986) model as a comparative tool. Although the western researchers very often use right and rules on one hand and rights and law on the other hand in some sort of confusing interrelationship, Islamic law/shariah hold its own simple definition. For example, western researchers say rights